EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) Report was prepared to document the justification for selecting and implementing a non-time-critical removal action at Operable Unit 1 at Hill Air Force Base (Hill AFB) near Ogden, Utah. Since site investigation studies at Operable Unit 1 (OU 1) have determined that contaminants are migrating off-Base via the shallow ground water, Hill AFB is proposing to implement a removal action to contain the contaminated ground water and prevent further off-Base migration. Given that there are no current users of the ground water, and therefore no immediate health threat, the proposed removal action is considered non-time-critical. Hill AFB believes, however, that it is prudent to implement the removal action in a timely manner instead of waiting until completion of the Remedial Investigation/Feasibility Study (RI/FS) for OU 1 and the subsequent signing of the Record of Decision (ROD) for the overall site remedy, which is not scheduled to occur until September of 1996.

Operable Unit 1, which is located on the northeastern border of Hill AFB, consists of Landfills (LFs) 3 and 4, Chemical Disposal Pits (CDPs) 1 and 2, Fire Training Areas (FTAs) 1 and 2, the Waste Phenol/Oil Pit (WPOP), and the Waste Oil Storage Tank (WOST). Disposal activities at OU 1 began in 1940 and continued until 1975. Materials disposed of, or burned, at the various areas include waste solvents, industrial sludges, residues from solvent cleaning operations, domestic refuse, sulfuric and chromic acid, methyl ethyl ketone, jet fuel, and waste oil.

Based on ongoing investigative studies, Hill AFB has identified areas where contamination is migrating off Base via the shallow ground water. The findings and conclusions of the baseline risk assessment conducted for the site indicate that there are no current users of the shallow off-Base ground water; therefore, there is no immediate human health risk. Under the current schedule, completion of the RI/FS activities and selection of an overall remediation strategy for the site will not occur until September of 1996 (the planned date for signing of the ROD). Immediately following the signing of the ROD, the Remedial Design (RD) phase will commence. Consequently, construction of a remedy may not begin until January of 1998. In order to expedite measures to halt the off-Base migration of contaminants as soon as possible, Hill AFB has elected to implement a removal action. According to the NCP, the first step in implementing a non-time-critical removal action is to conduct an EE/CA.

The scope of this EE/CA is to evaluate and recommend measures to achieve containment of contaminated ground water. Previous studies have identified both a dissolved contaminant plume and a light non-aqueous phase liquid (LNAPL) plume at OU 1. Since the existing ground water containment system (which was installed as an interim remedial measure) addresses only contamination in the eastern portion of OU 1, additional containment facilities are needed in the western portion of the site where the LNAPL plume and the most concentrated dissolved contaminant plume are found. In addition, a recent evaluation of the existing ground-water containment system has determined that the system is not achieving containment and therefore needs to be

upgraded or modified. This EE/CA evaluates alternatives for achieving containment on both the eastern and western portions of OU 1.

The overall objective of the removal action at OU 1 is to reduce the threat of human exposure associated with off-Base migration of contaminants in ground water. The specific objectives of the removal action are to:

- Minimize off-Base migration of dissolved ground-water contaminants and LNAPL from OU 1 with an appropriate containment system

- Initiate an effective removal action at OU 1 which is consistent with and contributes to the anticipated long-term remedial action at the site.

The four alternatives evaluated for the western portion of OU 1 are:

- Alternative 1: An extraction trench would be installed along the northern and northwestern border of the on-Base portion of OU 1 to create a hydraulic barrier against off-Base migration of contaminants.

- Alternative 2: Four separate extraction trenches would be installed in the sand and gravel channel where the LNAPL plume and most concentrated dissolved contaminant plume are located.

- Alternative 3: A slurry wall would be installed along the northern and northwestern border of the on-Base portion of OU 1 to create a physical barrier against off-Base migration of contaminants.

- Alternative 4: A sheet pile wall would be installed along the northern and northwestern border of the on-Base portion of OU 1 to create a physical barrier against off-Base migration of contaminants.

The four alternatives evaluated for the eastern portion of OU 1 are:

- Alternative 1: Additional extraction wells would be installed along the east side of Landfill 4 to create a hydraulic barrier to off-Base migration of contaminants.

- Alternative 2: An extraction trench would be installed along the east side of Landfill 4 to create a hydraulic barrier against off-Base migration of contaminants.

- Alternative 3: A slurry wall would be installed along the east side of Landfill 4 to create a physical barrier against off-Base migration of contaminants.

- Alternative 4: A sheet pile wall would be installed along the east side of Landfill 4 to create a physical barrier against off-Base migration of contaminants.

Based on the engineering evaluation and cost analysis, Alternative 3 is recommended for implementation on the western portion of OU 1. Alternative 3 involves installing a slurry wall along the northern and northwestern borders to act as a physical barrier to off-Base migration of contaminated ground water. Alternative 3 was selected for the following reasons:

- It utilizes a physical barrier
- Is the least susceptible to failure (if installed properly)
- Requires the lowest capital investment
- Is the least expensive over the long term
- Represents only a minor risk of exposure during implementation

A physical barrier is preferred over a hydraulic barrier because it is a more positive means of containment and it is not as reliant on the operation of electromechanical equipment (i.e., extraction pumps). If a pump in a gradient control well were to fail, there would be adequate time to detect and respond to the problem before any contamination escaped the containment system. This may not be the case with failure of a pump in an extraction trench. In addition, a physical barrier minimizes the amount of soil that needs disposal and the amount of ground water that needs to be extracted and subsequently treated at the IWTP. The two alternatives using hydraulic barriers also represented a risk that the resulting drawdown in the water table might allow the LNAPL to migrate into the clay, potentially making future remediation efforts more difficult.

The slurry wall was selected over the sheet pile wall because of the cost and the lower potential for leakage. With the sheet pile walls, it is more difficult to assure that all the joints are sealed and that the piles are sufficiently keyed into the clay. The sheet pile walls are also susceptible to corrosion unless costly measures are implemented to attempt to abate this concern.

Since the existing slurry wall at the site is not performing as an effective barrier to ground water flow, there is some concern about the ability to construct a slurry wall that will meet the performance objectives. The reason for its limited effectiveness is unknown, but it is believed to be related to poor construction quality control, such that the wall was not properly keyed into the clay. At the time of the installation, little data were available to characterize the subsurface. Since that time, significantly more information regarding the locations and variations of the clay layer has been obtained. Compatibility testing would also be conducted to ensure that the selected backfill mixture will meet the permeability and chemical resistance criteria. The site is well suited for application of this technology, and with proper engineering and construction quality control, a slurry wall can be built with a high degree of confidence.

A slurry wall (Alternative 3) is also recommended for implementation on the eastern portion of OU 1. Alternative 3 involves installing a slurry wall along the east side of LF 4 to create a physical barrier against off-Base migration of contaminated ground water. Alternative 3 was selected for the following reasons:

- It is consistent with the technology recommended for the western portion of OU 1.

- In incorporates and utilizes the existing facilities.

- It is the least expensive alternative over the long term.

- It is the least susceptible to failure and provides a more positive means of containment.

Although Alternative 3 requires a substantially greater capital investment to implement than Alternative 1 (extraction wells), it is less expensive over the long term because of the lower volume of contaminated ground water that needs to be treated. If the cost to discharge ground water to the IWTP is significantly reduced (this is currently being discussed for Operable Unit 8), Alternative 1 may be slightly less expensive over the long term. However, the wells are susceptible to fouling and would be more maintenance intensive. In addition, there is some uncertainty regarding the number of wells that will actually be needed to provide containment, which could increase the capital cost of Alternative 1.

There are some concerns with installing a slurry wall at the site. With proper engineering and construction quality control, however, a slurry wall can be built with a high degree of confidence.